

**SANBORN MAGNETIC
DATA RECORDING
7- AND 14-CHANNEL SYSTEMS
SERIES 3907A, 3914A**

SANBORN
SOD
INDUSTRIAL DIVISION

S-5M-3-64
S-10M-7-64



- *Tape Deck Especially Designed for Sanborn by Hewlett-Packard*
- *FM, Direct and Pulse Record / Reproduce Electronics*
- *Six Pushbutton Speeds — $1\frac{1}{8}$ IPS to 60 IPS with No Capstan Change*
- *Improved Signal / Noise Ratios*
- *Low Wow and Flutter*
- *Built-in Footage Counter*
- *All Solid-State Circuits*
- *Adjustable Input / Output Levels*

BASIC DESCRIPTION

SANBORN Model 3907A and 3914A are two new high performance Magnetic Tape Recording Systems designed for use in data recording, storage and reduction systems. The tape transports, designed exclusively for this equipment by Hewlett-Packard, provide improved flutter and distortion specifications; six speeds electrically selected without changing capstan or idler; 4 second max start time, 1 second max stop time; and a built-in footage counter. Both of these compact, versatile and low-cost-per-channel tape systems comply with all IRIG requirements.

Both systems offer interchangeable, FM, Direct and Pulse Record/Reproduce electronics consisting of solid state amplifier inserts and speed equalization plug-ins. All modules are readily accessible on the front panel to change bandwidth for each tape speed change. Each system contains a multi-track tape transport, insert rack and transfer chassis, preamplifier rack, power supply, (7 or 14) reproduce preamplifiers and cabinet. FM, Direct, or Pulse Amplifier Inserts, in any combination, plus appropriate speed equalization plug-ins are added to the basic assemblies.

The new Hewlett-Packard/Sanborn tape transports provide a total of six speeds; $1\frac{1}{8}$, $3\frac{3}{4}$, $7\frac{1}{2}$, 15, 30 and 60 IPS which allow for a maximum time expansion, or time compression of 32 to 1. Transports also have remote control connector for complete

recorder operation: Stop, Play, Reverse, Fast, Forward and Record. Tape loop adapter, voice channel, and input conditioning circuits are also available.

USES

Sanborn Model 3907A and 3914A 7- and 14-channel tape recording systems are so broadly applicable in both simple and complex recording, storage and data reduction systems that only the more general uses are mentioned here. Major fields include *telemetry, aircraft flight tests, jet and rocket engine tests, and vibration studies*. Optional tape loop attachment and voice channel increase the usefulness of tape systems for data analysis and teaching commentary applications. Direct, FM and Pulse modes permit single-ended input signals to be connected directly — input resistances are 20K, 20K, and 10K ohms, respectively. The input signal level can be 0.5 to 10 V rms on Direct, ± 1.2 to ± 3 V p to p on FM, and a zero based $-7\frac{1}{2}$ to -30 V rectangular pulse on Pulse. Push-pull signals can also be monitored by the tape systems through the use of an optional Sanborn Input Signal Coupler.

Medical researchers, teachers and clinicians will have wide use for the "3907A" and "3914A" in biophysical applications from simple data storage and processing to major physiological data monitoring systems.

DIRECT RECORD/REPRODUCE SYSTEM PERFORMANCE

This system uses a 3900-12A Direct Record/Reproduce Amplifier insert to proportionately record on the tape the AC input signal and when reproduction of this signal is required, reproduce the input AC signal as a proportional output voltage. Frequency compensation to allow for speed changes on all tracks in the *reproduce* mode is provided by individual plug-ins designed to slide into the amplifier inserts. A built-in bias oscillator provides a fixed amplitude high frequency signal which is mixed with the input voltage to compensate for the non-linearity of the tape.

RECORD AMPLIFIER INPUT: 20,000 ohms input resistance, single ended. 0.5 to 10V rms, adjustable.

REPRODUCE AMPLIFIER OUTPUT: Single ended, adjustable from 1V rms to 2.1V rms at ± 3 ma. Source impedance 100 ohms max. DC level adjustable ± 1.5 V.

THIRD HARMONIC DISTORTION: 1% typical at 1KC and 60 IPS.

Tape Speed	Bandwidth	Frequency Response	S/N Ratio Minimum RMS*
60 ips	100-100,000 cps	± 3 db	40 db
	300-70,000 cps		45 db
30 ips	100-50,000 cps	± 3 db	42 db
	300-35,000 cps		47 db
15 ips	50-25,000 cps	± 3 db	42 db
	300-16,000 cps		47 db
7½ ips	50-12,000 cps	± 3 db	42 db
	300-7,200 cps		47 db
3¾ ips	50-6,250 cps	± 3 db	42 db
	300-3,800 cps		47 db
1⅞ ips	50-3,125 cps	± 3 db	40 db
	300-2,200 cps		45 db

*Measured with bandpass filter at output with an 18 db/octave rolloff.

FM RECORD/REPRODUCE SYSTEM PERFORMANCE

This system uses the 3900-13A FM Record/Reproduce Amplifier Insert to convert an input voltage into a frequency which is proportionately related to the reference carrier frequency. Full scale input voltage produces a 40% change in carrier frequency. Signals appearing at the record head are square waves of current, sufficient to cause tape saturation on alternate half cycles. Reproduce head signals are fed into the 3900-10A preamplifier and then to the 3900-13A insert, where they are amplified, clipped and demodulated. Output voltage of the insert is proportional to reproduce frequency and hence, input voltage. An additional plug-in is placed onto the insert to provide suitable modulation and demodulation frequency characteristics and output filtering. A different equalization plug-in is required for each tape speed.

RECORD AMPLIFIER INPUT: Single ended, 20K impedance, ± 2.5 V DC nominal, adjustable ± 1.2 V to ± 3 V.

REPRODUCE AMPLIFIER OUTPUT: Single ended, 100 ohms source impedance maximum, ± 2.5 V DC nominal (at ± 3 ma maximum), adjustable ± 1.2 V to ± 5 V. DC position adjustable ± 2 V.

LINEARITY: DC, $\pm 0.5\%$ of full scale max; AC, $\pm 1\%$ of full scale max.

DRIFT: $\pm 0.25\%$ max for 10°C change, 15°C to 35°C. $\pm 0.25\%$ max for 10V line voltage change.

Tape Speed	Bandwidth	Frequency Response	FM Center Carrier Frequency (Nominal)	S/N Ratio over Bandwidth/Min RMS at 0% Frequency Deviation*	
				Without Flutter Comp	With Flutter Comp**
60 ips	0-10KC	+0, -1 db	54 KC	44 db	48 db
30 ips	0-5KC	+0, -1 db	27 KC	44 db	49 db
15 ips	0-2500 cps	+0, -1 db	13.5 KC	45 db	49 db
7½ ips	0-1250 cps	+0, -1 db	6.75 KC	40 db	47 db
3¾ ips	0-625 cps	+0, -1 db	3.38 KC	42 db	47 db
1⅞ ips	0-312 cps	+0, -1 db	1.69 KC	37 db	41 db

*Measured with lowpass filter at output with an 18 db/octave rolloff.

**Channel 3 and/or 10 provide flutter compensation.

PULSE RECORD/REPRODUCE SYSTEM PERFORMANCE

This system uses a 2000-1400-1 Pulse Record/Reproduce Amplifier Insert to record and reconstitute rectangular pulse signals. The tape is always driven to saturation. Plug-in sub-assemblies are not required for different tape speeds.

RECORD AMPLIFIER INPUT: Rectangular zero-based negative-going pulse, $-7\frac{1}{2}$ to -30 volts final amplitude. Rise and fall times are not important except when they influence timing of recorded signal. There is no upper limit on pulse duration.

INPUT RESISTANCE: Single ended, 10,000 ohms.

REPRODUCE AMPLIFIER OUTPUT: Rectangular zero-based negative-going pulse, approx. -11.8 volts final amplitude across open circuit. Output signal amplitudes and rise and fall times are not related to input signals except as noted above.

OUTPUT SOURCE RESISTANCE: Single ended, 1000 ohms; may be loaded. For example, with 1000 ohm load approx. 6 volts is available.

Record and Playback at	Max. Rise Time (micro-sec.)	Min. Input Pulse for Output Pulse Accuracy (Duration) (micro-sec.)	Accuracy of Pulse Reproduction (micro-sec.)	Typ. Min. Input Pulse for any Output (micro-sec.)
60 ips	4	50	± 5	10
30 ips	4	100	± 10	15
15 ips	5	200	± 20	25
$7\frac{1}{2}$ ips	10	400	± 40	35
$3\frac{3}{4}$ ips	20	800	± 80	50
$1\frac{7}{8}$ ips	40	1600	± 160	70

Recording at one speed and playing back at a different speed is possible. Rise time depends on playback speed. Minimum input pulse duration depends on record speed.

TAPE TRANSPORT SPECIFICATIONS

The tape transport provides tape motion for all modes of operation and assures smooth, positive movement of the tape across the head assembly. Operating controls are located on the front panel.

NUMBER OF TRACKS: 7 (Model 3907A), 14 (Model 3914A).

TRACK WIDTH: 0.05" (both models).

TRACK SPACING: 0.07" center-to-center (both models).

MAXIMUM INTERCHANNEL TIME DISPLACEMENT ERROR: ± 1 microsecond at 60 IPS, between two adjacent tracks on same head (both models).

TAPE SPEEDS: 60, 30, 15, $7\frac{1}{2}$, $3\frac{3}{4}$, $1\frac{7}{8}$ inches per sec. (both models).

TAPE WIDTH: $\frac{1}{2}$ " (Model 3907A), 1" (Model 3914A).

TAPE THICKNESS: 1.5 mil, 1.0 mil or 0.65 mil (both models) (1.0 mil preferred).

TAPE LENGTH: 2400 feet—1.5 mil tape; 3600 feet—1.0 mil tape. 4800 ft.—0.65 mil tape (both models).

REEL SIZE: $10\frac{1}{2}$ " NAB (both models) or Precision (Precision preferred).

START TIME: Approx. 4 sec. max.

STOP TIME: 1 second max.

REWIND TIME: Approx. 100 seconds for 2400 feet and 150 seconds for 3600 feet of tape (both models).

CONTROLS: Operating controls—Line (Power), Stop, Play, Reverse, Forward (fast), Record, are pushbutton relays. A receptacle at the rear of the transport is provided for remote control operation.

DRIVE SPEED ACCURACY: $\pm .25\%$ of nominal capstan speed, (both models) which is directly proportional to line frequency.

SYSTEM WEIGHT: Approximately 310 lbs. net, both models.

SYSTEM DIMENSIONS: $57\frac{3}{4}$ " high x 22" wide x 26" deep (both models).

SYSTEM POWER REQUIREMENTS: 105 to 125 volts RMS 60 cps ± 2 cps. Approx. 500 watts (both models).

FLUTTER (both models)		
Speed	Bandwidth	Flutter (p-p)
60 ips	0-200 cps	0.2%
	0-1.5 KC	0.3%
	0-10 KC	0.6%
30 ips	0-200 cps	0.2%
	0-1.5 KC	0.5%
	0-5 KC	0.8%
15 ips	0-200 cps	0.25%
	0-1.5 KC	0.45%
	0-2.5 KC	0.6%
$7\frac{1}{2}$ ips	0-200 cps	0.4%
	0-1.25 KC	0.65%
	0-200 cps	0.5%
$3\frac{3}{4}$ ips	0-625 cps	0.8%
	0-200 cps	0.8%
	0-312 cps	1.2%

REPRODUCE AMPLIFIERS

A preamplifier card provides the first three stages of amplification for the reproduce section of a record/reproduce channel. There are 7 preamplifier cards for the Model 3907A system and 14 preamplifier cards for the Model 3914A system.

INSERT RACK AND TRANSFER CHASSIS

Each insert rack and transfer chassis contains a power supply and accommodates up to seven record/reproduce amplifier inserts complete with equalization plug-ins.

POWER SUPPLY

The Power Supply, located on the Insert Rack and Transfer Chassis, delivers regulated operating voltages to all electronic circuits of the recording system. Supply voltages can be measured at test points on the front panel. A built-in meter and a selector switch is used for alignment of all FM channels, eliminating the need for electronic counters.

PRICES BASIC ASSEMBLIES

MODEL 3907A, 7 track Basic System with provisions for additional monitoring track. Consists of 6 speed tape transport (1 7/8, 3 3/4, 7 1/2, 15, 30, 60 IPS), Insert Rack and Transfer Chassis, Power Supply, Preamplifier Rack, (7) Reproduce Preamplifiers and Mobile Cabinet. **\$6,185.00**

MODEL 3914A, 14 track Basic System with provisions for additional monitoring track. Consists of 6 speed tape transport (1 7/8, 3 3/4, 7 1/2, 15, 30, 60 IPS), (2) Insert Racks and Transfer Chassis, (2) Power Supplies, (2) Preamplifier Racks, (14) Reproduce Preamplifiers and Mobile Cabinet. **8,415.00**

OPTION 1 FOR MODELS 3907A AND 3914A
Same as Models 3907A and 3914A less cabinet, but including all the necessary hardware for rack mounting in 19" racks.

Model 3907A, Option 1 **5,680.00**
Model 3914A, Option 1 **7,910.00**

OPTION 2 FOR MODELS 3907A AND 3914A
Same as Models 3907A and 3914A except systems are mounted in portable cabinets.

Model 3907A, Option 2 **6,185.00**
Model 3914A, Option 2 **8,415.00**

OPTION 3 FOR MODEL 3907A, 7 track Basic System, same as above, less monitoring track provisions (when available). **Subtract 135.00 from any of the above**

OPTION 3 FOR MODEL 3914A, 14 track Basic System, same as above, less additional monitoring track (when available) **Subtract 135.00 from any of the above**

ELECTRONICS

Add to the Basic Assembly the number of FM, Direct, or Pulse Reproduce Inserts required (each active channel will require one Insert according to the recording requirements).

Model 3900-12A Direct Record-Reproduce Insert **\$155.00 ea.**

Model 3900-13A FM Record-Reproduce Insert **180.00 ea.**

For each Model 3900-12A Insert depending on the tape speeds to be used—select from the following plug-ins:

1 7/8 IPS — Model 2000-1200-C2 Direct Equalization Plug-in **35.00**
3 3/4 IPS — Model 2000-1200-C3 Direct Equalization Plug-in **30.00**
7 1/2 IPS — Model 2000-1200-C4 Direct Equalization Plug-in **30.00**
15 IPS — Model 2000-1200-C5 Direct Equalization Plug-in **30.00**
30 IPS — Model 2000-1200-C6 Direct Equalization Plug-in **30.00**
60 IPS — Model 2000-1200-C7 Direct Equalization Plug-in **30.00**

For each Model 3900-13A Insert depending on the tape speeds to be used—select from the following plug-ins:

1 7/8 IPS — Model 2000-1300-C2 FM Frequency Plug-in **60.00**
3 3/4 IPS — Model 2000-1300-C3 FM Frequency Plug-in **40.00**

7 1/2 IPS — Model 2000-1300-C4 FM Frequency Plug-in **40.00**

15 IPS — Model 2000-1300-C5 FM Frequency Plug-in **40.00**

30 IPS — Model 2000-1300-C6 FM Frequency Plug-in **40.00**

60 IPS — Model 2000-1300-C7 FM Frequency Plug-in **40.00**

MODEL 2000-1400-1 PULSE RECORD-REPRODUCE INSERT (No Plug-in required) **60.00**

OPTIONAL EQUIPMENT

Input Signal Coupler Model 3907-07A — to adapt equipment with push-pull output to single-ended input of the 3900 series electronics; it occupies 3 1/2 inches of vertical panel space below record-reproduce amplifier panel. **395.00**

A plug-in depending on signal source is required for each active channel (see local field office for information)

Remote Control Panel Model 3907-11A — control box and cable for remote control of tape transport STOP, PLAY, REVERSE, FAST FORWARD and RECORD functions (less cable) **100.00**

Voice Channel Amplifier Model 3907-06A for recording pertinent commentaries on the data being recorded, includes microphone **250.00**

Note 1: When used with Models 3907A and 3914A for monitoring on the additional track another Reproduce Preamplifier (\$40.00), one Direct Insert (\$155.00) and one Direct Equalization Plug-in (Price is determined by the speed used) are required.

Note 2: When used with Option 3 of either system where no provisions for an additional channel are included, one of the standard 7 or 14 tracks must be used with a Direct Insert and Equalization Plug-in.

MAGNETIC TAPE: ACCESSORY ITEMS

37T-4 1/2 Inch, 1 Mil Polyester Heavy Duty 1-9 **35.35**
Instrumentation Tape, 3600 Feet, 10-49 **33.40**
Supplied On NAB Reels: 50 & over **31.40**
37T-5 1/2 Inch, 1.5 Mil Polyester Heavy 1-9 **27.00**
Duty Instrumentation Tape, 2500 10-49 **25.45**
Feet, Supplied On NAB Reels: 50 & over **31.40**
37T-9 1 Inch, 1 Mil Polyester Heavy Duty 1-9 **64.60**
Instrumentation Tape, 3600 Feet, 10-49 **61.15**
Supplied On NAB Reels: 50 & over **57.75**
37T-10 1 Inch, 1.5 Mil Polyester Heavy Duty 1-9 **49.90**
Instrumentation Tape, 2500 Feet, 10-49 **47.20**
Supplied On NAB Reels: 50 & over **44.50**

Empty Reels:

37T-3 1/2 Inch, NAB **7.75**
37T-14 1/2 Inch, Precision **29.50**
37T-8 1 Inch, NAB **13.25**
37T-15 1 Inch, Precision **32.00**

Splicing Tape:

37T-7 1/2 Inch, Mylar, 100 Feet **1.55**

Bulk Eraser:

48A-13 (Cinema Type 9205A) **102.50**

Head Demagnetizer:

48A-14 (Robins Type HD-6) **12.50**

Tape Splicer:

48A-15 1/2 Inch, (Robins Type TS-500) **77.50**

Cabinet Dust Cover:

01060-69010 Gabardine, For 3907A and 3914A. **17.00**

Prices are F.O.B. Waltham, Massachusetts, except accessory items which are priced F.O.B. Destination.

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